

## NUTRITION IN DIABETES

There are two basic types of diabetes: *diabetes insipidus* and *diabetes mellitus*. Diabetes insipidus is a rare metabolic disorder caused either by a deficiency of the pituitary hormone vasopressin or by the inability of the kidneys to respond properly to this hormone. Failure to produce adequate amounts of vasopressin is usually the result of damage to the pituitary gland. Diabetes insipidus is characterized by extreme thirst and by the production of enormous amounts of urine, regardless of how much liquid is consumed.

Diabetes mellitus results from a defect in the production of insulin by the pancreas. Without insulin, the body cannot utilize glucose (blood sugar), its principal energy source.

As a result, the level of glucose circulating in the blood is high and the level of glucose absorbed by the body tissues is low. Perhaps more than most diseases, diabetes mellitus is associated with diet. It is a chronic disorder of carbohydrate metabolism that over time increases the risk of kidney disease, atherosclerosis, blindness, and neuropathy (loss of nerve function). It also creates a predisposition to infections such as candidiasis and can complicate pregnancy. Although genetics may make a person susceptible to diabetes, a diet high in refined, processed foods and low in fiber and complex carbohydrates is believed to be behind most cases of the disease. Those who are overweight face the greatest risk of developing diabetes.

Diabetes mellitus is generally divided into **two categories**: type I, called insulin-dependent or juvenile diabetes, and type II, or non-insulin-dependent diabetes. Type I diabetes is associated with destruction of the beta cells of the pancreas, which manufacture insulin. This type of diabetes occurs mostly in children and young adults. Recent evidence implicates a viral cause in some cases of this disorder. Autoimmune factors may also be involved.

Symptoms of type I diabetes include irritability, frequent urination, abnormal thirst, nausea or vomiting, weakness, fatigue, weight loss despite a normal (or even increased) intake of food, and unusual hunger. In children, frequent bedwetting — especially by a child who did not previously wet the bed — is another common sign.

People with type I diabetes are subject to episodes in which blood glucose levels are very high (hyperglycemia) and very low (hypoglycemia). Either of these conditions can lead to a serious medical emergency.

Episodes of hypoglycemia, which strike suddenly, can be caused by a missed meal, too much exercise, or a reaction to too much insulin. The initial signs of hypoglycemia are hunger, dizziness, sweating, confusion, palpitations, and numbness or tingling of the lips. If not treated, the individual may go on to experience double vision, trembling, and disorientation; may act strangely; and may eventually lapse into a coma.

In contrast, a hyperglycemic episode can come on over a period of several hours or even days. The risk for hyperglycemia is greatest during illness, when insulin requirements rise; blood sugar can creep up, ultimately resulting in coma, a reaction also known as diabetic ketoacidosis. One of the warning signs of

developing hyperglycemia is the inability to keep down fluids. Possible long-term complications include stroke, blindness, heart disease, kidney, failure, gangrene, and nerve damage.

The second category of diabetes mellitus, often referred to as maturity-onset diabetes, is most likely to occur in people with a family history of diabetes. In this type of the disorder, the pancreas does produce insulin, but the insulin is ineffective. Symptoms include blurred vision, itching, unusual thirst, drowsiness, fatigue, skin infections, slow wound healing, and tingling or numbness in the feet. The onset of type II diabetes typically occurs during adulthood and is linked to a poor diet. Other signs that may be associated with diabetes include lingering flulike symptoms, loss of hair on the legs, increased facial hair, and small yellow bumps known as xanthomas anywhere on the body. Balanoposthitis (inflammation of the penile glans and foreskin) often is the first sign of diabetes and is usually associated with frequent urination day and night.

Some individuals have impaired glucose tolerance (IGT), indicating an asymptomatic subclinical, or latent, form of diabetes. IGT describes those whose plasma glucose levels and responses to glucose are intermediate, somewhere between those of a diabetic and a healthy person.

### **Diabetes Self-Tests**

There are several ways to test yourself for diabetes. The tests for type I diabetes are also used for self-monitoring by persons diagnosed with the condition.

#### *Type I Diabetes (Insulin-Dependent or Juvenile-Onset diabetes)*

To test for type I diabetes:

1. Purchase chemically treated plastic strips at a drugstore.
2. Prick your finger and apply a drop of blood to the tip of the strip.
3. Wait one minute and compare the color on the strip to a color chart, which lists various glucose levels.

There are also electronic devices available that can analyze the test strip for you and give you a numerical readout of the glucose level. It is a device that all people with diabetes should own.

#### *Type II Diabetes (Maturity-Onset Diabetes)*

Those with type II diabetes mellitus often cannot perceive sweet tastes. This abnormality may play an important role in how individuals with diabetes perceive the taste of their food, and also in how well they comply with the dietary aspects of treatment. Because our society as a whole is addicted to sugar, this distorted taste perception is very common among the population in general.

The following test can detect an impaired ability to taste sweets.

1. Do not consume stimulants (coffee, tea, soda) or sweets for one hour before the test.
2. Fill seven identical glasses with 8 ounces of water each and label the glasses as having no sugar, 0,25 teaspoon sugar, 0,5 teaspoon sugar, 1 teaspoon sugar, 1,5 teaspoons sugar, 2 teaspoons sugar, and 3 teaspoons sugar. Add the appropriate amount of sugar to each glass, then ask someone else to rearrange the order of the glasses and hide the labels.
3. Take a straw and sip from each glass, then write down the amount of

sugar you think it contains. Between sips, rinse your mouth with pure water.

Healthy people generally notice a sweet taste when a teaspoon or less of sugar is added to 8 ounces of water. By contrast, people with adult-onset diabetes usually do not notice sweetness until 1,5 to 2 teaspoons of sugar have been added to the water.

### **Herbs**

Cedar berries are excellent nourishment for the pancreas.

Ginseng tea is believed to lower the blood sugar level.

*Caution:* Do not use this herb if you have high blood pressure.

Huckleberry helps to promote insulin production.

Other herbs that may be beneficial for diabetes include bilberry, buchu, dandelion root, goldenseal, and uva ursi.

### **Recommendations**

1. Eat a high-complex-carbohydrate, low-fat, high-fiber diet including plenty of raw fruits and vegetables as well as fresh vegetable juices. This reduces the need for insulin and also lowers the level of fats in the blood. Fiber helps to reduce blood sugar surges. For snacks, eat oat or rice bran crackers with nut butter or cheese. Legumes, root vegetables, and whole grains are also good.

2. Supplement your diet with spirulina. Spirulina helps to stabilize blood sugar levels. Other foods that help normalize blood sugar include berries, brewer's yeast, dairy products (especially cheese), egg yolks, fish, garlic, kelp, sauerkraut, soybeans, and vegetables.

3. Get your protein from vegetable sources, such as grains and legumes. Fish and low-fat dairy products are also acceptable sources of protein.

4. Avoid saturated fats and simple sugars (except when necessary to balance an insulin reaction).

5. Eat more carbohydrates or reduce your insulin dosage before exercise.

6. Exercise produces an insulin like effect in the body. Talk to your doctor about the right approach for you.

7. Do not take fish oil capsules or supplements containing large amounts of para-aminobenzoic acid (PABA), and avoid salt and white flour products. Consumption of these products results in an elevation of blood sugar.

8. Do not take supplements containing the amino acid cysteine. It has the ability to break down the bonds of the hormone insulin and interferes with absorption of insulin by the cells.

9. Do not take extremely large doses of vitamins B<sub>1</sub> (thiamine) and C. Excessive amounts may inactivate insulin. These vitamins may, however, be taken in normal amounts.

10. If symptoms of hyperglycemia develop, go to the emergency room of the nearest hospital. This is a potentially dangerous situation. Intravenous administration of proper fluids, electrolytes, and insulin may be required.

The **glycemic index** or **glycaemic index (GI)** is a measure of how quickly blood glucose levels (i.e., blood sugar) rise after eating a particular type of food. The effects that different foods have on blood glucose levels vary considerably.

The glycemic index estimates how much each gram of available carbohydrate (total carbohydrate minus fiber) in a food raises a person's blood glucose level following consumption of the food, relative to consumption of pure glucose. Glucose has a glycemic index of 100.

A practical limitation of the glycemic index is that it does not take into account the amount of carbohydrate actually consumed. A related measure, the glycemic load, factors this in by multiplying the glycemic index of the food in question by the carbohydrate content of the actual serving.

Glycemic index charts often give only one value per food, but variations are possible due to variety, ripeness, cooking methods, processing, and the length of storage. Potatoes are a notable example, ranging from moderate to very high GI even within the same variety.

The glycemic response is different from one person to another, and also in the same person from day to day, depending on blood glucose levels, insulin resistance, and other factors.

Most of the values on the glycemic index do not show the impact on glucose levels after two hours. Some people with diabetes may have elevated levels after four hours.

GI values can be interpreted intuitively as percentages on an absolute scale and are commonly interpreted as follows:

**Table 15**

**Glycemic Index (GI) of Foods**

<i><b>Group</b></i>	<i><b>GI</b></i>	<i><b>Examples</b></i>
Low GI	55 or less	Beans (white, black, pink, kidney, lentil, soy) , almond, peanut, walnut, chickpea; small seeds (sunflower, flax, pumpkin, poppy, sesame), most whole intact grains (durum, spelt, kamut, wheat, millet, oat, rye, rice, barley); most vegetables, most sweet fruits (peaches, strawberries, mangos); fructose
Medium GI	56–69	Whole wheat or enriched wheat, pita bread, basmati rice, unpeeled boiled potato, grape juice, raisins, prunes, pumpernickel bread, cranberry juice, regular ice cream, sucrose, banana
High GI	70 and above	White bread (only wheat endosperm), most white rice (only rice endosperm), corn, extruded breakfast cereals, glucose, maltose, maltodextrins, potato, pretzels, parsnip, bagels, beer

**Table 16**

**Table of glycemic index and load values**

<i><b>High-carbohydrate foods</b></i>	<i><b>GI</b></i>
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White wheat bread	75±2
Whole wheat/whole meal bread	74±2
Speciality grain bread	53±2
Unleavened wheat bread	70±5
Wheat roti	62±3
Chapatti	52±4
Corn tortilla	46±4
White rice, boiled	73±4
Brown rice, boiled	68±4
Barley	28±2
Sweet corn	52±5
Spaghetti, white	49±2
Spaghetti, whole meal	48±5
Rice noodles†	53±7
Udon noodles	55±7
Couscous†	65±4
Cornflakes	81±6
Wheat flake biscuits	69±2
Porridge, rolled oats	55±2
Instant oat porridge	79±3
Rice porridge/congee	78±9
Millet porridge	67±5
Muesli	57±2
<i>Fruits</i>	
Apple, raw†	36±2
Orange, raw	43±3
Banana, raw	51±3
Pineapple, raw	59±8
Mango, raw	51±5
Watermelon, raw	76±4
Dates, raw	42±4
Peaches, canned	43±5
Strawberry jam/jelly	49±3
Apple juice	41±2
Orange juice	50±2
<i>Vegetables</i>	
Potato, boiled	78±4
Potato, instant mashed	87±3
Potato, french fries	63±5
Carrots, boiled	39±4
Sweet potato, boiled	63±6
Pumpkin, boiled	64±7
Plantain/green banana	55±6

Taro, boiled	53±2
Vegetable soup	48±5
<i>Dairy products</i>	
Milk, full fat	39±3
Milk, skim	37±4
Ice cream	51±3
Yogurt, fruit	41±2
<i>Legumes</i>	
Soy milk	34±4
Rice milk	86±7
Chickpeas	28±9
Kidney beans	24±4
Lentils	32±5
Soya beans	16±1
<i>Snacks products</i>	
Chocolate	40±3
Popcorn	65±5
Potato crisps	56±3
Soft drink/soda	59±3
Rice crackers/crisps	87±2
<i>Sugars</i>	
Fructose	15±4
Sucrose	65±4
Glucose	103±3
Honey	61±3

A low-GI food will release glucose more slowly and steadily, which leads to more suitable postprandial (after meal) blood glucose readings. A high-GI food causes a more rapid rise in blood glucose levels and is suitable for energy recovery after exercise or for a person experiencing hypoglycemia.

The glycemic effect of foods depends on a number of factors, such as the type of starch (amylose versus amylopectin), physical entrapment of the starch molecules within the food, fat and protein content of the food and organic acids or their salts in the meal — adding vinegar, for example, will lower the GI. The presence of fat or soluble dietary fibers can slow the gastric emptying rate, thus lowering the GI. In general, coarse, grainy breads with higher amounts of fiber have a lower GI value than white breads. However, most breads made with 100% whole wheat or wholemeal flour have a GI not very different than endosperm only (white) bread. Many brown breads are treated with enzymes to soften the crust, which makes the starch more accessible (high GI).

While adding fat or protein will lower the glycemic response to a meal, the relative differences remain. That is, with or without additions, there is still a higher blood glucose curve after a high-GI bread than after a low-GI bread such as pumpernickel.

Fruits and vegetables tend to have a low glycemic index. The glycemic index can be applied only to foods where the test relies on subjects consuming an amount of food containing 50 g of available carbohydrate. But many fruits and vegetables (not potatoes, sweet potatoes, corn) contain less than 50 g of available carbohydrate per typical serving. Carrots were originally and incorrectly reported as having a high GI. Alcoholic beverages have been reported to have low GI values; however, beer was initially reported to have a moderate GI due to the presence of maltose. This has been refuted by brewing industry professionals, who say that all maltose sugar is consumed in the brewing process and that packaged beer has little to no maltose present. Recent studies have shown that the consumption of an alcoholic drink prior to a meal reduces the GI of the meal by approximately 15%. Moderate alcohol consumption more than 12 hours prior to a test does not affect the GI.

Many modern diets rely on the glycemic index, including the South Beach diet, Transitions by Market America and NutriSystem Nourish. However, others have pointed out that foods generally considered to be unhealthy can have a low glycemic index, for instance, chocolate cake (GI 38), ice cream (37), or pure fructose (19), whereas foods like potatoes and rice have GIs around 100 but are commonly eaten in some countries with low rates of diabetes.

The GI Symbol Program is an independent worldwide GI certification program that helps consumers identify low-GI foods and drinks. The symbol is only on foods or beverages that have had their GI values tested according to standard and meet the GI Foundation's certification criteria as a healthy choice within their food group, so they are also lower in kilojoules, fat and/or salt.

The most important task of a rational diet therapy of diabetes mellitus in the present conditions is to replace the excessive consumption of refined carbohydrates substances having a sweet taste, but do not contain calories and almost no insulin secretagogue.

According to the modern classification of sugar substitutes:

- To the group of sweeteners (which are metabolized by the combustion of 1.0 gram of 4 kcal) include fructose, xylitol, and sorbitol;
- A group of **sweeteners** (practically not possess valuable energy value) include saccharin, aspartame, cyclamate, acesulfame potassium, neotame, sucralose, lactulose, neohesperidin, thaumatin, glycyrrhizin and stevioside.

Modern pharmacology to meet the human tendency to "sweet" life to the exclusion from the diet of sugar and sugar-containing products are widely introduces the use of sugar substitutes and sweeteners, although in terms of the physiology of the use of such chemicals is not necessary.

**Fructose** feature that it is absorbed more slowly and less pronounced effect on the blood sugar level than glucose or sucrose. It is particularly important that the absorption of fructose by the body occurs without insulin. In the mild form of diabetes may be used in an amount of fructose 35-40 grams per day, in which case it has no adverse effect on the blood sugar level.

**Sorbitol** and **xylitol** - polyhydric alcohols, sweet taste, are readily soluble in water. The sweetness of the sweetness of sugar corresponds xylitol, sorbitol, 2-fold

less sweet. Xylitol and sorbitol not cause a significant rise in blood sugar levels, have a mild laxative and choleretic effect. The caloric content of xylitol and sorbitol are sugar that must be considered when calculating the quota carbohydrate diet of the patient. The daily dose of xylitol or sorbitol can not exceed '35

**Saccharin** in moderate amounts harmless to the body, it in 400-450 times sweeter than sugar, are well soluble in water. Since saccharin has no energy value, it can not be taken into account when calculating the caloric intake. In cooked food is added when it is ready, otherwise it may cause a bitter taste.

**Aspartame** - synthetic sweetener consisting of the amino acids phenylalanine and asparagine. He is 100-150 times sweeter than sugar, has no energy value is destroyed at high temperature (boiling and baking), so its use is limited sweetening tea, coffee and other beverages.

In the table the data on foods that are recommended for patients with diabetes, foods that should be eaten in moderation, and products to be excluded from the diet.

### Diabetes and foods

Food groups	Reccomended foods	Foods that should be eaten in moderation	Products to be excluded from the diet
Vegetables, fruits	All fresh and frozen vegetables, beans, lentils, peas, corn, boiled potatoes, whole fresh fruit, canned (without sugar) and dried fruit	Chips (vegetable oil), dried fruits with a high content of carbohydrates (dried apricots, raisins), salty canned vegetables	Cooked in animal fat potatoes, other vegetables, cereals (rice)
Meat	Beef, veal, turkey, chicken, rabbit, poultry, lamb meat	Sausages	Fatty goose, duck, fat meat
Fish	Boiled river, sea fish	fried fish	Too fat fish eel, beluga, and fish cooked on animal fat
Seafood	Mussels, lobster, scallops	oysters, shrimp, squid	
Milk, dairies	Skim milk, yogurt with very low sugar, low-fat cottage cheese, cheese with low fat content (20%)	Milk (1.5% fat 2) cheeses with higher fat content (up to 30%), low fat sour cream	Whole milk, fatty cheese, condensed milk, cream, sour cream, fat yogurt
Eggs	Protein omelet	Not more than 1 egg per day	—
Bread, cereals	Rye bread, bread with bran, oat groats	Bread, wheat, rice and other cereal grains	Buns, rolls of puff pastry
Nuts	—	Pine nuts, walnuts, peanuts, hazelnuts, almonds, pistachios, chestnuts	—
Fat	—	Sunflower oil, corn oil, olive oil, cottonseed oil, margarine on the basis of these oils. Butter in an amount	Lard



Food groups	Reccomended foods	Foods that should be eaten in moderation	Products to be excluded from the diet
		recommended by the treating physician	
Seasoning	pepper, herbs, mustard, spices	Salad dressings, low-fat	mayonnaise, cream
Sweets	sweeteners	—	Sugar, chocolate, sweets, cakes
Desserts	Fruit Salad	Jellies, cooked on low-fat milk, cake "meringue"	Ice cream, sauces, cooked using butter and cream, puddings.
Drinks	Tea, mineral water, coffee	Alcohol drinks	Strong coffee, chocolate drinks